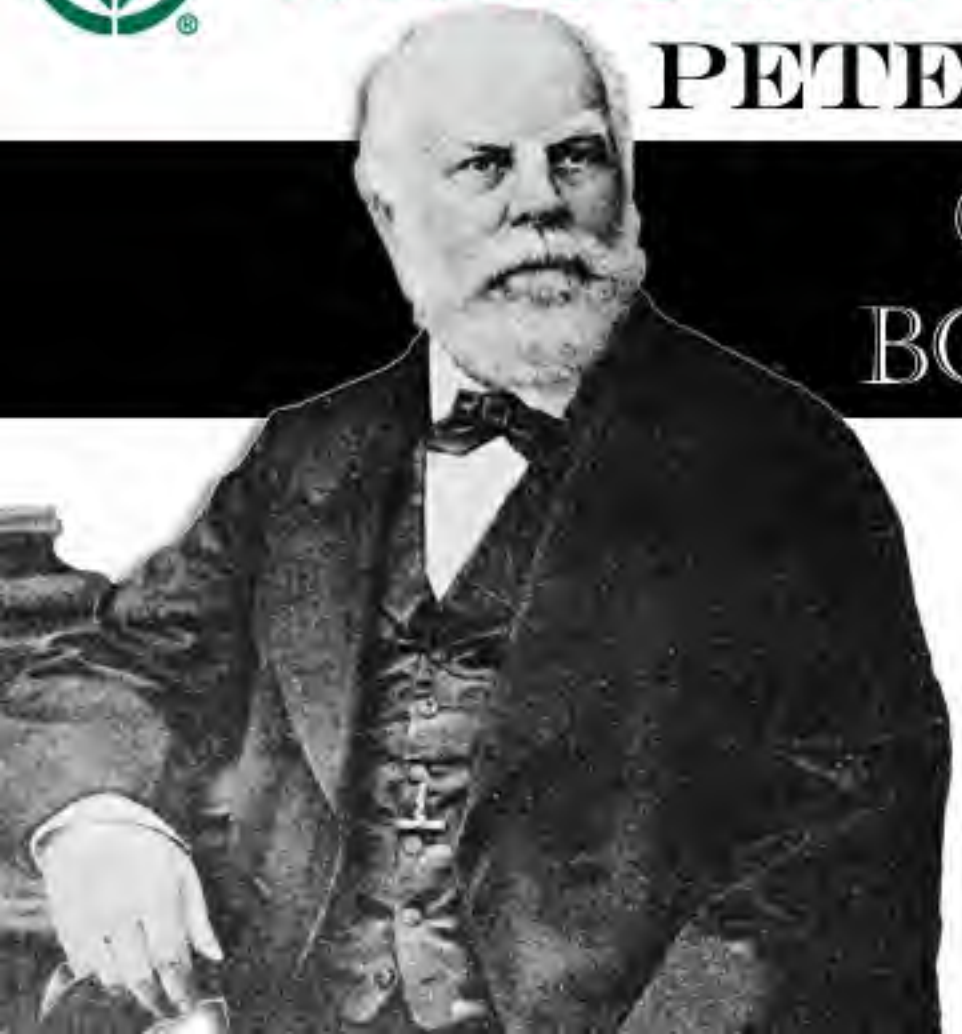
# Missouri Botanical Garden
## Peter H. Raven Library

# George Engelmann Botanical Notebooks



*Pagination Note:*
*Since many of the items lack a specific page number, the page number displayed online refers to the sequentially created number each item was given upon cataloging the materials.*

Nov 1863

## Pollen of Coniferæ

A. Braun Parthenogenesis 1856 p. 367. compars Pollencells with the Embryosack and refers to Schacht, Beitraege zur Anat & Phys d Gew. 1854. p. 148 & 284 t. 2. –

J. Currey in his translation of Schacht's work on the Microscop, second Edit London 1855, append the chapters (refers here) of the Beitraege p. 172–192 of his publication, with figures in woodcut. – From Prof Gray's copy I make the following extracts –

p. 172. In all other cases the pollentube is a prolongation of the innermost Pollencell but in all Coniferæ examined by me (Schacht) a body of several cells is formed within the Pollengrain and the terminal cell of this body displaces the contents of the real pollencell and eventually forms the [always single] pollentube.

Fritzsche, tratise on Pollen, noticed the existance of these cells

Meyer, Vegetable Physiology vol III p. 188. accurately describes and figures them of Larix; also found them in Abies & Pinea; – in some
p. 173 Liliaceæ scientan cells in the pollengrains were found by him, but free

Jelezroff (Ann Sc. Nat. 1850) gave a history of the development of the Pollen and Embryo of the ~~Larch~~ Larch.

The bud of the male catkin of Abies pectinata is formed in the spring, at the time of the opening of the branchbud, as small green protuberances in the axis of a leaf, on the under side of the yong branch; during summer
p. 174 scales are formed, surrounding the punctum vegetationis (the rudiment catkin); in the fall no more leaves are formed, but ~~of that~~ only leaves which become developt into anthers. – The catkin bud in Abies is on the under side of the branch and numerous, the rose bud on the upper side and ~~yea~~ solitary. – Even in August the yong anther of Abies, Pinea Pinus & Larix is globular; by the end of September the yong Pollengrains are found in each mothercell of these anthers. Now till Spring no changes of importance take place. At the beginning of May the pollengrains of Abies & Pinea lie in 4 in the interior of their mothercell.

175 mothercells of Pinea vulgaris which have become 4-cornular by formation of special mothercells – yong pollengrains shape = 112 & 113. – This at the beginning of May. – The special mothercells (discovered by Naegeli) are a layer of cellulose secreted by the

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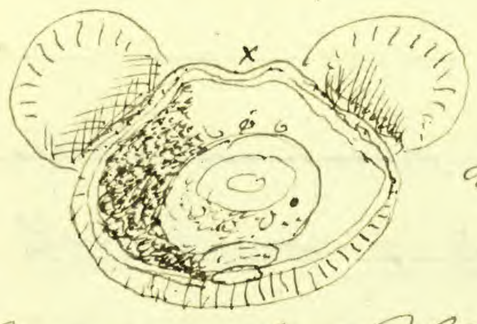
primordial utricle of the pollenwall; this last itself has originated by division of the primordial utricle

The escaped Pollenmass is now no longer round, the two lateral excrescences are already perceptible 114 115 of the developed Pollengrain

p. 176 f. 116 point of egress of pollentube x 600 of Pirea



117 ripe Pollen of Abies pectinat

118 ripe Pollen of Picea vulgaris

both soaked ½ hour in oil of lemons — x 600

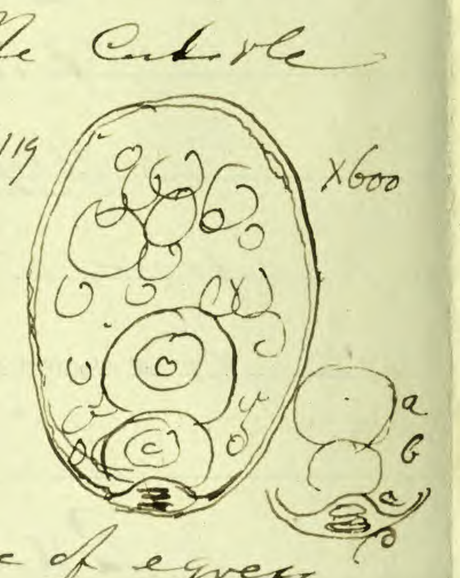
a egress of Pollentube.

There is a fissure between the outer and inner membrane i. e. between the pollenwall and cuticle; above this fissure the pedicel-cell of the cellular body seems to be seated. The cuticle seems to consist of two layers.

p. 177 Ripe Pollengrain of Larix Europaea in water

a terminal cell of cellular body b, larger pedicel cell c. & d. smaller pedicel cells having the appearance of fissures in the membrane of the pollengrain. The place of egress of the pollentube is opposite to the cellular body, also in the Lark and true pollenwall

f. 119 x 600



f. 120 x 600

Pollen of Larch in concentr. Sulph. Acid — Contents have disappeared, some oil drops only (a. a.) are seen, the cuticle remained, but rosecoloured exhibits two layers — and is thin at the spot where the egress of tube.

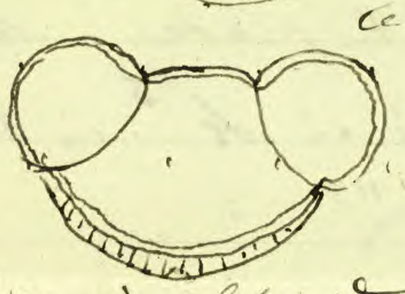
p. 178 Oil of lemons or turpentine makes the Pollen transparent and permits the cellular body plainly to be seen. —

f. 121 x 300

Sulph. acid on quite fresh Pollen brings on a swelling and protrusion of the pollenwall

This figure represents Picea vulgaris Pollen with Nitric acid

f. 122



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Picea in Sulph. acid interior structure destroyed

pollenwall in Larix, cellular body pressed out by nitric acid.

p. 179 Always 3 cells of cellular body in Abies pectinata, Picea vulgaris and Pinus sylvestris [in Larix always? 4 cells]

In Pinus sylvestris the terminal cell of the body grows to —

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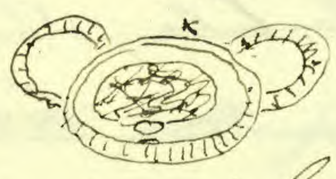
that it sometimes displaces the granular contents of the Pollen-
cell, and fills up the cavity of the same.

p. 180 f.125 ×200 f.126



terminal cell of cellular body
fills the cavity; Pollencell
gelatinous and distended.

Dry Pollengrain of P. Sylvestris same in lemonoil —

128 129 ×400 Of two ripe Pollengrains of Pinus sylv. the Pollencell
is forced out by Nitric acid — the cells of the
cellular body and the swollen walls of the pollencell
are seen. It is probable that at last the terminal cell of the cell.
body forms the Pollentube and has the same contents of granular
matter as the original Pollencell. "In the Larch the cuticle is completely
stripped off by the tubular prolongation of the Pollencell" probably
is often Conifers the same.

p. 181 Cycadeae have a spherical pollen, and folded when
dry — only one place for egress of Pollentube

1. Coniferae & Cycadeae have naked ovules, originating in an
open fruitscale

2, The embryosac of both families produces corpuscula, which
are large cells of the albumen, varying in number, and situated
at the apex of the embryosac, into which the pollentube enters
in order that after having extended itself within the corpusculum
it may form the first cells of the embryo. In all other phenogams
the corpuscula are wanting; the pollentube simply enters the
embryosac and forms therein the first cells of the Embryo

p. 182 3, The Pollentube in these families is not a prolongation
of the inner true pollencell, but an extension of the
terminal cell of a small body consisting of several cells
which body originates in the interior of the pollencell
the contents of which it appropriates to the purposes of
its own development.

p. 183 In the spring 1854 further observations afforded the following
results: 1, In the Larch shortly before the opening of the anther the
Pollencell divides into two unequal halves a & b; the lesser (b) is opposite [close to?]
the place of egress of P. Tube; this last cell becomes again
and generally again divided. In this manner the cellular body

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originates; the two lower cells semi stationary — the contents disappear; the two upper ones continue to grow the upper most becomes the pollentube; which destroys the cortex of the Larger dorsalwise cell (a), and bores through it

2, In those Coniferae which have anthers with pollensacs (Cupressus, Thuja, Juniperus, Taxus) a similar division of p. 184 pollencell in the round pollengrain takes place; the smaller undergoes no change, and the larger one becomes pollentube In Cupressus the pollengrain often protrude tubes which still in the pollensacs.

3, The scales which carry the pollensacs are the true anthers these sacs in Thuja, Cupressus, Callitris & Juniperus commun are on the underside of the stalk, in Taxus the sacs appear in the form of 5 or 6 loculi on the inner side around the stem of the shieldlike anthers; they open like the others by fissure. Similar are the pollensacs of Cycadeae, not real anthers but only those parts of the anthers which perfect the pollen. — The ament of Coniferae & Cycadeae is therefore a single flower, and not analogous to the catkin of Amentaceae.

4 Anthers of Podocarpeae = Abieteae, Cedreae: Loculi p. 185 towards the outer lower side, opening by a perpendicular longitudinal fissure — Pollen equal to that of Pines with 2 exosporary — Ephedra has oval pollengrain, with 6 longitudinal ribs.

5, The division of the pollencell (only visible in quite fresh Pollen). In Juniperus communis where the pollengrain lies almost inactive on the nucleus for a year, takes place in the second spring. In Taxus it is inactive on the nucleus for several weeks, the division oft takes place already in the anther; also in Thuja & Cupressus; the same in Abieteae though in Pinus the pollentubes do not reach the Embryosac and corpuscula until the following year.

6 The cortex of Pollen Coniferae is stripped off when the tube is developed, and in Abieteae the lacerated remnants of the covering of the pollencell and derivative cells are oft pendulous

pollen cells of the.
on the ~~cellular body~~ ~~nucleus~~ cells forms the termination of the pollen tube. The detached, collapsed outside may often be seen on the nucleus.

7, The contents of the pollengrains vary according to development starchgrains large & small and granular matter, not starch.

"Hofmeister considers the existence of phytozoa (Keimung Wachsen Cryptogamen etc p. 132) in the pollentubes of Coniferae probable — I have never found them." — Free cells never originate in the corpuscula of the Conifers. — Several pollentubes generally reach the embryosac through the tissue of the nucleus; nevertheless one pollentube can impregnate several corpuscula — The pollentube forces its way between the cells of the so-called Rosette, i.e. the cells which cover the apex of the corpusculum; the latter cells are pushed four apart by the pollentube, which then appears like a bladder in the interior of the corpusculum; the "mock cells" then make way for the pollen tube. "Hofmeisters opinion, that a cell existing in the corpusculum is impregnated by the pollentube, is erroneous, since no cell is present in the corpusculum before the entry of the pollentube. New and extended observations made upon Lathraea and Viscum have convinced me that of the accuracy of Schleiden's theory according to which the first cells of the future plant originate in the pollentube itself." [afterwards recanted by Schacht himself]

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Pseudostrobus

aristata (Parry) 4

muricata (Brewer) 4

leiophylla (Gregg) 6 (-8)

Montezumae (Gregg) 9 - 10

Sylvestres quaternatae

Sylvestres ternatae

ponderosa Rocky Mts

Calif.

Jeffreyi (Boland. N. 1)

Cubensis (Wright) 15-16)

"tuberculata" H.B. Mss. 8

Jeffreyi (Boland. N. 1) 6 - 8

Chihuchuana (Wright) 8

ponderosa (Fendler) 10 (Wright) 10

" ? (Boland.) 10 (A. Lyall) 12-13

Canariensis Naples 4-5

Sylvestres Cembrae

Sylvestris 3

pumilio (H.B. Mss) 9-10 H.B. Cambr. 6(-7) Solalex 6(-7) (Carlsruh) 6 (Chudyn) 6

rotundata H.B. Berl. 4

resinosa (H.B.M.) 6 (Mack) 6

contorta (Parry 1864) 6 (Parry 1862) 6(-8) (Lyall) 5-6

(Boland. N. 2) 6-8 (Brewer 2092) 6 (Brewer (=830) 8

pinaster (Parry) 3(-4)

maritima (3-)4

Brutia (Naples) 4-6

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Flowers!

# Involucres of Male Aments of Pinus

## Pinus : masc. cal. 4-phyllus (Cod Lin. pag 946

Number of involucral bracts (Calyx, Lin
mss 829 always more than 2, primary, lateral and keeled (important character is their proportion to the length of the other) 2nd is posterior to axis of fl. — opposite axis of reflexus (and bract) 4 anterior or opposite bract. 5 x 6 lateral &c.

### Pinea

P. Sabiniana (Bolander) 12 Wiliz (15) (Brewer) 10 (Naples) 18-19

### Cembroides

monophylla (Fremont) 5-6 (H Engelm) 6

Parryana (Parry) 4

edulis (Wislize) 4 (Fendler Parry) 5

### Cembra

cembra Cambridge 6-8

flexilis Parry 8-9

### Strobus

Strobus (Frankfort) 8 New Hampsh. 6-7

excelsa (Cambridge) 8-9 (Bethlehem) 8-9

Lambertiana (Parry) 14-16

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sometimes
very deep and even tubular (1/2 – 1 inch deep) ~~with~~ covered with brown lanceolate (imbricate ~~subpubescent~~) scales; nut slender, ovate ?
3/4 – 1 1/2 inches long. — Prod 16.2.67. Cuyler oaks 396 Q. Morehus, Kellogg Proc. Ac. Calif. 2. 36. R.

Var. frutescens, shrub 3–10 feet high, with smaller ~~leaves~~ oval entire or spiny-dentate leaves, 1–1 1/2 inches long.

Throughout the State
Common in the Valleys and on the lower Mountains, ascending into the Sierras; Shasta, Mount Diablo, Santa Lucia Mountains, Brewer, Anderson Valley, Bolander; the variety is the "desert-oak" of the southeastern desert, Parry, Santa Anna, Brewer 137, to Battle Creek and Shasta, Brewer 1467. — A magnificent tree with shining, dark green, very dense foliage, sometimes 10–12 or even 18 feet (Shasta, Brewer) in circumference, 50–60 feet high; bark paler and smoothish when young, very rough and black in old trees; wood said to be tough and durable. Leaves persist 14 or 15 months, longer than in the last, but rarely until the fruit matures; winter buds oval, 1–2 lines long, brown and shining and slightly ciliate; cups very variable in size, often deeper than in any other N. American Oak. This species has ~~often~~ been confounded with Q. agrifolia, but is readily distinguished by its biennial fruit, the strongly reticulated, shining leaves etc; some forms closely approach the next species, which, however, has deciduous leaves and obtuse acorns.

broader, more deeply lobed

++ Leaves deciduous.

13. Q. Kelloggii, Newberry. A middle sized tree with rough black bark; branchlets soon glabrate; leaves broadly oval, pinatifid-lobed (like those of Q. cornea), 3–7 1/2 rarely 6 inches long, with lobes entire and tapering or broad and lobe-dentate, in early youth tomentose or nearly glabrous, at last glabrate, thick; petioles slender, 8–15 lines long; aments stellate-pubescent or smoothish, calyx with 5 broad ciliate lobes, bearing 4 or 5 anthers; acorns mostly on pedunculs, 1/2 – 1 inch long, often several together; cups hemispherical, often very deep (6–8 lines wide, 8–12 lines deep) with ovate-lanceolate closely imbricate scales; nuts oblong, obtuse 12–16 l. long, 10–12 wide. — Pacif.

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# Juvenile

Skotts and Coss. have also Cordophylla

Conif. divides upwards — (deciduous lower part of the trunk)

deciduous

Evolution of deciduous leaves.

Persistence of leaves — of deciduous after 2 yrs — with 3d articulate (not scales (on the trunk)) resinous. Cleaves'

Juvenile of 3 (3-4) sylvestris. pinaster (3-4) Calyx 4-phyllus Lin

4 Pampam edulis (5) Balfour dumosa (3-6) Pinea (4-7) Halepis (4-6)

Canariensis Greggii Abiolfouriana

6 Strobus (-8) monophylla (5-6) Massoniana (6-7) nordmanniana (6-7) resinosa (6-7)

Cembra Lambertiana contorta (6 months) halepensis (6-8)

virginiana 6-8 Brunkeana (6-8) pumila 6-8 mexicana (6-8)

8-10 monticola flexilis (8-9) Cembra (6-8) insularis Pyrenaica (4-10)

Chihuahuana (8-10) Thunbergii Lambertiana (8-10) austriaca (8-12) cil

Coulteri (8-10) Jeffreyi (10) montis (9-12) mugo 8-10

10-15 excelsa (8-11) Pinea (9-10) Khasiana (13-14) Merkusii 12 Thunbergii 9-13

ponderosa 10-12 Sabiniana (10-15) Taeda 8-12 glabra 12-14

Elliottii 12) Canariensis 14-16. Australis 12-14

12-19 Lambertiana 14-16 Sabiniana 12-19.

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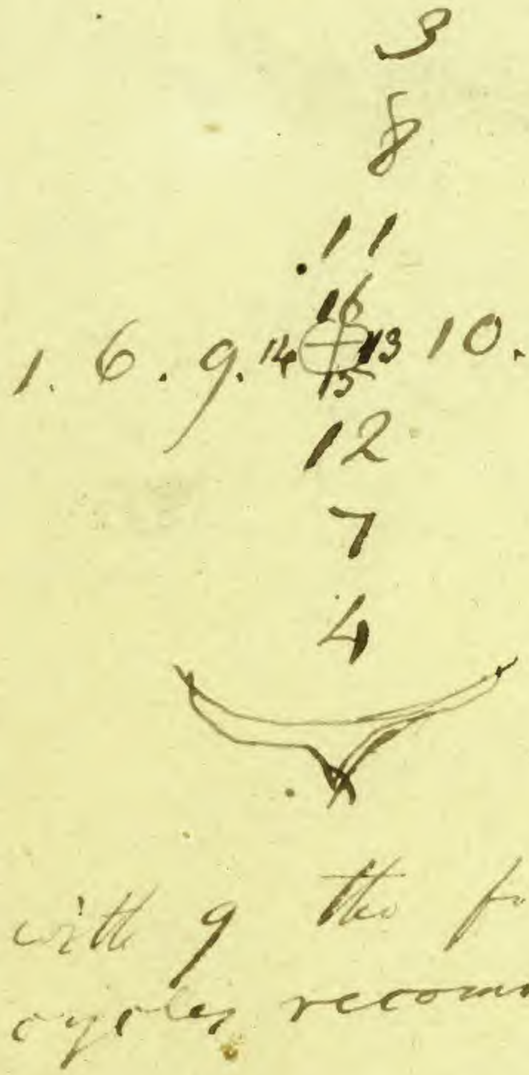
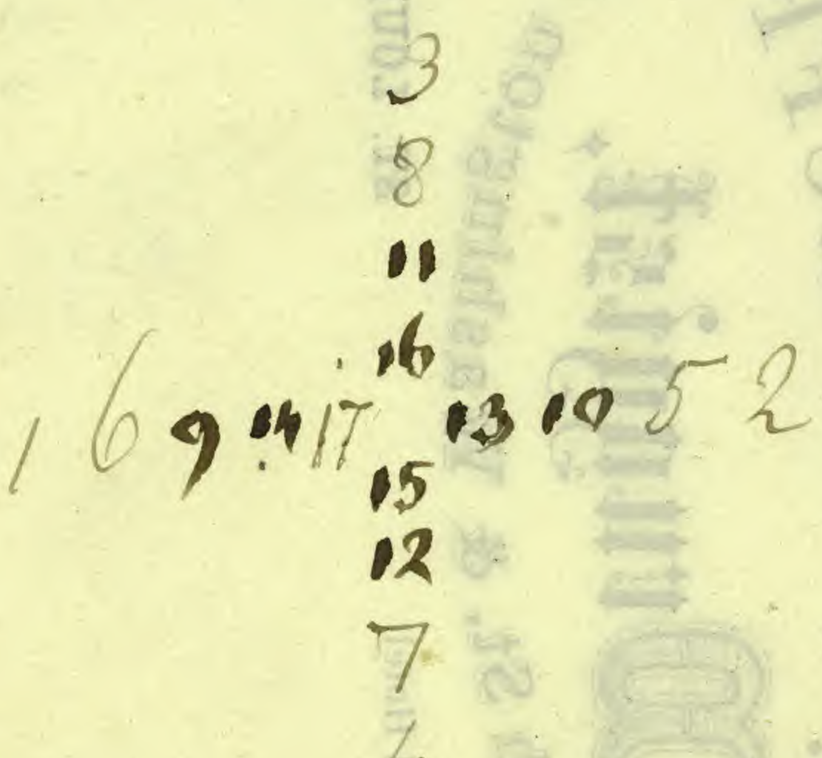
Arrangement of involucral scales
of male anets and of ligule flowers




with 9 the first
cycle recommence

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/ 3150 / 0,084
3320
1300

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# Involucrum of Male aments of Pinus

[ Linné (Cod. p. 946) cal 5 4-phyllus : P. gemma : Abies 3-4

**3 involucral bracts**

P. sylvestris (~~P. maritima~~) P. Pinaster (P. densiflora)

**4 involucral bracts** (or with a 5th one)

P. Greggii P. aristata ~~P. maritima~~ (or 3) x Balfouriana

P. Canariensis (or) Pstrobus, Luk P. densiflora (or 3)

(P. Bruttii) P. edulis (or 5) P. Parryana

**6 (or rarely 7–8) involucral bracts** pungens (6-8)

P. pumilio (6-7) P. Mugbus (P. rigida) P. resinosa (6-8)

P. Strobus (6-8) P. Cembra P. leiophylla P. muricata,

P. contorta (5–6) P. Halepensis (5–6) Lariccio "Bruttii"

"P. maritima" (reape) P. Syriaca" P. monophyllos (5–6) Pinea (7) Banksiana (5-7)

**8 involucral bracts** (or 9–10

P. Banksiana P. flexilis . (P. Jeffreyi) P. inops

P. rigida P. serotina P. tuberculata (6-8)

P. excelsa (P. Cembra) P. Chihuahuana

(P. Montezumae) Coulteri (8–9) australis

**10 or 13 involucral bracts** insignis (10) inops dense (8-13)

P. Austriaca (8–12) P. Montezumae P. Jeffreyi (or)

P. mitis P. ponderosa glabra (12–14) Pinea

**14–19 involucral bracts**

P. Lambertiana (14–16) P. Sabiniana (12–19)

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Washington University
St. Louis May 28. 1863

Dear Sir,

The final Examination of the Senior Class of Washington University, in Italian, will be held, from 11½ A.M. to 1 P.M. on Tuesday next, (June 2nd).

A committee consisting of yourself, Dr. L. Safel, Dr. Baumgarten & Mr. J. Keim, is respectfully invited to attend the Examination.

Very truly Yours
W. Chauvenet
Chancellor

Dr. G. Engelmann.

P.S. It shall be pleased to have your attendance at all the Examinations on Monday & Tuesday from 9 A.M. to 1½ P.M.

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involucral bracts

Sylvestres Gerardiae

"Lyriara" Naples 6

Halepensis (Algiers) 4–5 (Naples) 6 (Litt. Bernh.) 5–6

Densiflora (Sup. Herb Bernh.) 3–4

Laricio

var Calabra H.B. Naples 6

Austriaca (H.B. Vien.) 8–13 H.B. Cambr. 8 (Berl.) 8 (Naples) 10–11

muricata (Parry Monterey) 6

Taeda

Taeda (Carolina) 12–13 (Delaware) 8 Texas (11–12

rigida (Charlestown) 8 (Oswego) 6–7

inops (Charlestown) 8–9

mitis (Virginia Dwarf) 10–12 (Missouri) (9–10

Banksiana (Lapl.) 7 (Oswego) 7–8

serotina (H.B.M.) 8–9

Greggii (Saltillo) 4

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arrived this morning from
Mr. Green, in the same box
with an instrument for the
University. I send
all that came marked
for me, by the bearer.

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Linné (Ed Linn pg 946)

Pinus: masc. cal. 4 phyllus

(— Abies: masc. Cal. gemma

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